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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/510,479	10/07/2004	Seitaro Matsuo	T0203.0008/P0008	7443

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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1763

MAIL DATE	DELIVERY MODE
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07/17/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/510,479	Applicant(s) MATSUO ET AL.	
	Examiner Rakesh K. Dhingra	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>03/07</u> | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 3/28/07 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. In this case no concise explanation of relevance of foreign document No. KR-10-0197113 has been supplied by the applicant. It has been placed in the application file, but the information referred to therein has not been considered.

Response to Arguments

Applicant has amended independent claim 7 by adding new limitations "first resonance units having a length $\lambda/2$ (λ : guide wavelength) but not having openings in a side, and second resonance units having a length $\lambda/2$ (λ : guide wavelength) and having at least one second opening in a side, arranged sequentially from the terminal end portion". Further, applicant has cancelled claims 1-6 and added new claim 13.

Accordingly claims 7-13 are now pending and active.

New reference (US patent No. 5,707,452 - Dandl) when combined with Yoshiki et al and Kou et al reads on amended claim 7 limitations. Accordingly claim 7 has been rejected under 35 USC 103 (a) as explained below. Further, remaining claims 8-13 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshiki et al (US Patent No. 5,843,236) in view of Kou et al (US Patent No. 6,246,175) and Dandl (US Patent No. 5,707,452).

Regarding Claim 7: Yoshiki et al teach a microwave plasma apparatus (Figures 1, 2, 8) comprising:

- a rectangular plasma generation chamber 7 with an opening;
- rectangular shaped electro-magnetic coils 10 and magnet 10c for generating static magnetic field in the plasma chamber;
- a hollow waveguide with straight shape 18 with termination 19 at its end and with plurality of slots 18 in the side face of the waveguide, and a microwave window 16. Yoshiki et al also teach that by shifting the position of long slots 18b and 18c the strong and weak portions of the electric fields of microwaves can be superimposed on each other and power of microwaves radiated to plasma chamber

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can be made more uniform over a wide range of area (column 8, lines 35-65 and column 15, line 10 to column 17, line 40).

Yoshiki et al do not explicitly teach the microwave introducing means includes a straight shape microwave cavity resonator between a terminal end portion having no opening and an end portion having a first opening disposed at a distance of $n \times (\lambda_{\text{g}}/2)$ (n : an integer of 3 or more) from the terminal end portion, and in the side of the straight shape microwave cavity resonator, first resonance units having a length λ_{g} (λ_{g} : guide wavelength), but not having openings in a side, and second resonance units having a length of λ_{g} (λ_{g} : guide wavelength) and having at least one second opening in a side, are alternately arranged sequentially from the terminal end portion a plurality of open areas each having at least one second opening are disposed at an interval corresponding to the guide wavelength λ_{g} of the standing waves of the microwaves, so that microwaves in phase are introduced through the second opening into the plasma chamber.

Kou et al teach a plasma apparatus (Figures 1, 2, 5, 6) comprising a rectangular processing chamber 60 and a microwave introduction means having a straight shaped adjustable cavity resonator 100 (microwave introduction means) with a first terminal end and a second terminal end 11 with first opening 12. Kou et al also teach that distance between a terminal end of the cavity and the other end having first opening 12 is a design parameter and is set such that resonant condition is maintained in the cavity. Kou et al further teach that cavity resonator 100 has plurality of vertical vanes 20 separated by interval strips 30 and the distance L between is a period between the vanes which is one of the design parameters that is optimized (result effective variable) to obtain desired microwave electromagnetic field distribution. Kou et al further teach that distance between a terminal end of the cavity and the end having first opening is: $49 \times 11 = 539 \text{ mm}$ or 53.9 cm , where period $L = 49 \text{ mm}$, which includes the range given in the claim formula (that is, $\lambda_{\text{g}}/2 \times n$, where n is 3 or more and λ_{g} is approx. 12.24 cm for frequency of 2.45 GHz). It would be obvious to optimize the distance between a terminal end of the

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cavity and the other end having an opening as per related process parameters including resonant frequency of microwaves (column 3, line 10 to column 6, line 50).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use straight shaped microwave cavity resonator with first and second ends and optimize the distance between first and second ends as taught by Kou et al in the apparatus of Yoshiki et al to obtain desired microwave electromagnetic field distribution for processing large area substrates (column 2, lines 20-35).

Yoshiki et al in view of Kou et al do not teach in the side of straight shape microwave cavity resonator, first resonance units having a length λ_g (λ_g : guide wavelength), but not having openings in a side, and second resonance units having a length of λ_g (λ_g : guide wavelength) and having at least one second opening in a side, are alternately arranged sequentially from the terminal end portion a plurality of open areas each having at least one second opening are disposed at an interval corresponding to the guide wavelength λ_g of the standing waves of the microwaves, so that microwaves in phase are introduced through the second opening into the plasma chamber.

Dandl teach an ECR microwave plasma applicator (Figures 2, 3, 4B) comprising of antenna arrays 60A, 60B (resonant cavity structure) that include a plurality of slots (openings) 63 with radiating stubs 62 that are $\lambda/2$ long and alternate with non-slotted portion which is also $\lambda/2$ long (like first and second resonance units with and without openings) {claim 7 does not recite any structure for the resonance units}. Dandl further teach that size and spacing of stubs 62 (that is, the size and spacing of slots) is selected to obtain a resonant cavity structure and coherent (like in-phase) microwaves can be supplied to the processing chamber [column 9, line 51 to column 12, line 15].

Therefore it would have been obvious to one of skills in the art at the time of the invention to use first resonance units without opening and second resonance units with opening, that are arranged sequentially from the terminal end portion of the microwave cavity resonator as taught by Dandl in the

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apparatus of Yoshiki et al in view of Kou et al to generate distributed microwaves for large area and uniform plasma applications.

In this connection courts have ruled (Case law):

It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshiki et al (US Patent No. 5,843,236) in view of Kou et al (US Patent No. 6,246,75) and Dandl (US Patent No. 5,707,452) as applied to Claim 7 and further in view of Hiroshi et al (US Patent No. 5,389,154).

Regarding Claim 8: Yoshiki et al in view of Kou et al and Dandl teach all limitations of the claim except that microwave introducing means includes microwave branching means.

Hiroshi et al teach an ECR plasma apparatus (Figure 1) comprising:

a plasma generation chamber 20, magnetic coils 50, waveguide 33 with dividing circuit 64 (microwave branching means comprising of microwave branching portion 37 – page 16, lines 15-25 of the specification) [column 6, lines 40-60] *for the purpose of...*

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use microwave introducing means which include branching and binding means as taught by Hiroshi et al in the apparatus of Yoshiki et al in view of Kou et al and Dandl to enable control formation of node and the phase of the magnetic fields of microwaves (column 7, lines 15-50).

Regarding Claims 9, 11: Hiroshi et al teach that apparatus is an ECR plasma apparatus.

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Regarding Claims 10, 12: Yoshida et al teach the apparatus comprises rolls 14, 15 (sample moving means for moving large sized objects on page 8, lines 10-22) around which a sheet shaped object 13 (rectangular area of surface of sample) to be processed is wound and moved for processing the same (page 15, lines 60-67).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshiki et al (US Patent No. 5,843,236) in view of Kou et al (US Patent No. 6,246,75) and Dandl (US Patent No. 5,707,452) as applied to Claim 7 and further in view of Goulouev (US Patent No. 6,169,466).

Regarding Claim 13: Yoshiki et al in view of Kou et al and Dandl teach all limitations of the claim except opening between first and second resonator units.

Goulouev teach a waveguide (Figure 1) with plurality of resonator cavities 16A (resonator units) 16A and having a microwave channel 15 (opening) between successive resonator units (Figure 15) [column 4, lines 1-22].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to provide an opening between first and second resonator units as taught by Goulouev in the apparatus of Yoshiki et al in view of Kou et al and Dandl to provide a path for electromagnetic energy to flow through the waveguide.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing

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date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rakesh K. Dhingra


Karla Moore
Primary Examiner
Art Unit 1763